CHEMICAL PROPERTIES OF BUTANEDIOL

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https://doi.org/10.5281/zenodo.7655389

Annotation

This article expresses chemical properties of butanediols. Also, butanediols isomers as an organic compound have been analyzed and learned.

Key words: chemistry, butanediol, butylene glycol, 1,2-butanediol, 1,3-butanediol, 1,4-butanediol, 2,3-butanediol, properties, diol

It is clear that us, chemistry is a science that deals with the composition, structure, and properties of substances and with the transformations that they undergo, the composition and chemical properties of a substance.

World demand for butanediol, according to various estimates, exceeds supply by 15–25%, and sometimes, depending on the region, by 35%.

Butanediol, also named butylene glycol, it may refer to any one of four stable structural isomers, they are followings: 1,2-Butanediol, 1,3-Butanediol, 1,4-Butanediol, 2,3-Butanediol.

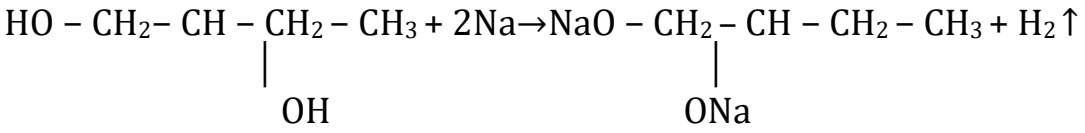
1,2-Butanediol is the organic compound with the formula $HOCH_2(HO)CHCH_2CH_3$. It is classified as a *vic*-diol (glycol). It was first described by Charles-Adolphe Wurtz in 1859.

1,3-Butanediol is an organic compound with the formula $CH_3CH(OH)CH_2CH_2OH$. With two alcohol functional groups, the molecule is classified as a diol. The compound is a colorless, bittersweet, water-soluble liquid. It is one of four common structural isomers of butanediol.

1,4-Butanediol, colloquially known as BD or BDO, is a primary alcohol, and an organic compound, with the formula $HOCH_2CH_2CH_2CH_2OH$. It is a colorless viscous liquid. It is one of four stable isomers of butanediol.

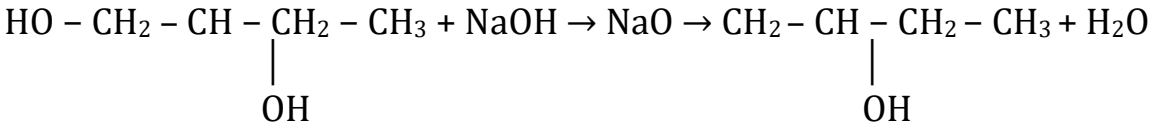
Chemical properties of 1,2-butanediol, 1,3-butanediol, 1,4-butanediol, 2,3-butanediol are given followings:

a) Interaction of alcohols with metals



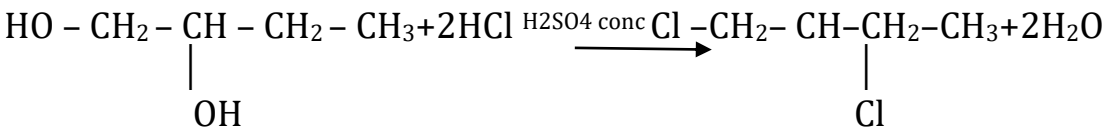
butanediol-1,2 + 2 sodium → butanediol-1,2-sodium disubstituted + hydrogen ↑

b) Acidic properties of polyhydric alcohols



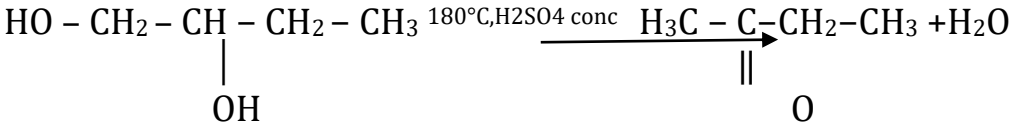
butanediol-1,2 + sodium hydroxide →butanediol-1,2-sodium monosubstituted + water

c) Obtaining halogenoalkanes from alcohols



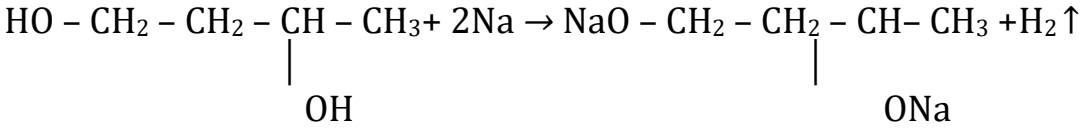
1,2-butanediol + 2 hydrochloric acid → (conc sulfuric acid) → 1,2-dichlorobutane + 2 water

d) Intramolecular dehydration of alcohols



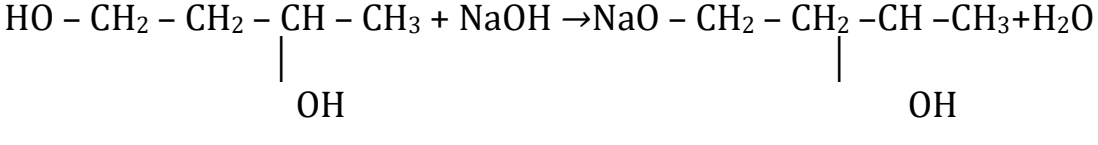
butanediol-1,2 → (t°=180°C, conc sulfuric acid) → butanone + water

e) The interaction of alcohols with metals



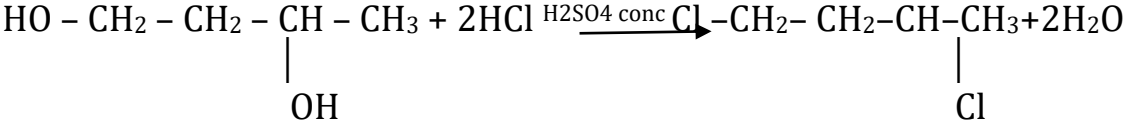
butanediol-1,3 + 2 sodium → butanediol-1,3-sodium disubstituted + hydrogen ↑

f) Acidic properties of polyhydric alcohols



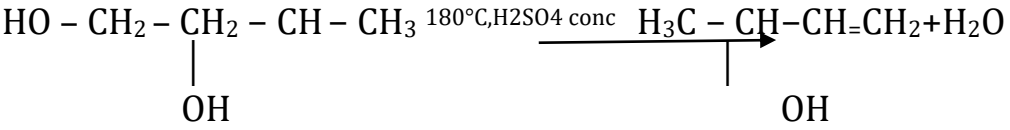
butanediol-1,3 + sodium hydroxide → butanediol-1,3-sodium monosubstituted + water

g) Preparation of haloalkanes from alcohols



1,3-butanediol + 2 hydrochloric acid → (conc sulfuric acid) → 1,3-dichlorobutane + 2 water

h) Intramolecular dehydration of alcohols



butanediol-1,3 → (t°=180°C, conc sulfuric acid) → buten-3-ol-2 + water

i) The interaction of alcohols with metals

$HO - CH_2 - CH_2 - CH_2 - CH_2 - OH + 2Na \rightarrow NaO - CH_2 - CH_2 - CH_2 - ONa + H_2\uparrow$

1,4-butanediol + 2 sodium → disubstituted sodium butanediol-1,4-ate + hydrogen↑

f) Acidic properties of polyhydric alcohols

$HO-CH_2-CH_2-CH_2-CH_2 - OH + NaOH \rightarrow NaO- CH_2 - CH_2 -CH_2 -CH_2 -OH+H_2O$

1,4-butanediol + sodium hydroxide → monosodium butanediol-1,4-ate + water

g) Preparation of haloalkanes from alcohols

$HO-CH_2-CH_2-CH_2-CH_2-OH+2HCl \xrightarrow{H_2SO_4\ conc} Cl-CH_2-CH_2-CH_2-CH_2-Cl+2H_2O$

1,4-butanediol + 2 hydrochloric acid → (conc sulfuric acid) → 1,4-dichlorobutane + 2 water

h) Intramolecular dehydration of alcohols

$HO - CH_2 - CH_2 - CH_2 - CH_2 - OH \xrightarrow{180°C,H_2SO_4\ conc} HO- CH_2- CH_2 -CH=CH_2+H_2O$

butanediol-1,4 → (t°=180°C, conc sulfuric acid) → buten-3-ol-1 + water

If we analyze, one of the most important monomers, which is of fundamental importance for the development of a number of industries in the world, are butanediols. More than 2.5 million tons per year is used in the production of polyester materials and polyurethanes, polybutylene terephthalate, polyvinylpyrrolidone and special solvents.

At the same time, butanediols and their intermediates are also used in low-tonnage chemistry as components in the production of medicinal compositions and polymeric materials for pharmacy, which are used in medicine.

In particular, it is known that busulfan, an alkyl sulfonate, which is a derivative of butanediols and methane sulfonic acid, is used as an alkylating antitumor agent in chemotherapy for the treatment of oncological diseases.

In conclusion, in chemistry butanediol is an organic synthesis product used for the production of tetrahydrofuran, polybutylene terephthalate, gamma-butyrolactone, etc. And also, it is a raw material for derivatives used in the petrochemical industry, the polymer industry, agrochemistry, pharmaceuticals, it is classified as a precursor. By studying the properties of butanediols in the teaching of chemistry, students learn and research their future applications in the chemical industry.

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